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Eye ON Technology

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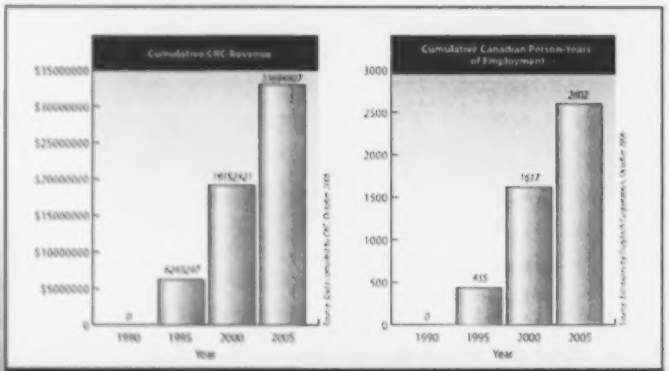
In This Issue...

Doyletech study: Multi-million dollar annual economic impact from CRC

Sales from companies that can be traced from the Communications Research Centre Canada (CRC) amounted to $1.61 billion dollars in 2005 according to a comprehensive study conducted by Doyletech Corporation.

The recent study examined two major areas of CRC's economic impact – company formation and the effect of technology licensing and sponsored research and development (R&D) activities in generating corporate sales and employment.

Using the extensive Doyletech database augmented by new research, the Ottawa-based consulting firm tracked the creation and growth of 62 start-up companies that are still in existence. In over 40 years, these companies were either formed around CRC technology or by CRC employees leaving the laboratory to establish a start-up firm. In 2005, these spin-off companies had collective annual sales calculated at $1.61 billion and 6,378 employees. The estimated tax revenues returned to the federal



Commercialization of technology transferred from CRC to Canadian companies resulted in the creation of 2602 cumulative person-years of employment.

Canada

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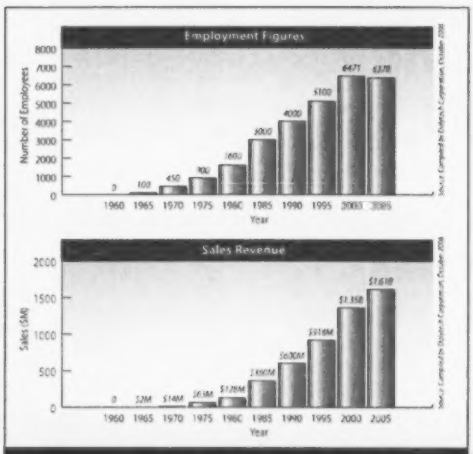
CRC



In 2005 alone, spin-off companies contributed over $300 million in taxes from their revenues of $1.6 billion.

government in 2005 from this activity was about $320 million. The resulting CRC family tree (viewable at http://www.crc.ca/files/crc/home/info_crc/crc_familytree_2006_e.pdf) depicts more than 100 companies and organizations whose origins can be traced to CRC and its spin off companies.

"This is a pretty good return to the Canadian taxpayer for an establishment that has an annual operating budget of well under $50 million," said Denzil Doyle, chairman of Doyletech Corporation and chief consultant for the study.

The study also quantified the economic impact of CRC's technology licensing and collaborative research agreements. CRC clients generated $33.7 million in licensing and contracting revenue over a 15-year reporting period, of which $17.3 million came from Canadian companies. Doyle examined CRC licensing fees and revenues earned from sponsored R&D dating from 1990, the beginning of the agency's formal technology transfer program. The data were aggregated at five-year intervals between 1990 and 2005.

Using CRC's records, Doyletech developed a formula to compute sales and employment based on the type of company and the usage it made of the CRC technology. The impact of CRC's 961 licensing and sponsored research agreements is attributed by Doyletech to have generated $520 million in sales and created 2,602 "person years of employment" over 15 years.

As part of it technology transfer program, CRC has been actively working to increase commercialization of its laboratory-developed intellectual property – through Canadian companies and other institutional receptors that are in a position to convert CRC innovation into products, services or processes.

The Doyletech study is the first of its kind to quantify CRC's economic payback based on laboratory-reported royalty streams and contract revenues. Doyle developed a methodology which assigned multiplier ratios to the different company types to compute sales and employment as a result of the technology transfer.

In 2003, CRC was honored through a special award from the Federal Partners in Technology Transfer for being the best federal laboratory in technology transfer.

CBC Radio-Canada tunes in to CRC software tool

A research tool developed by the Communications Research Centre Canada (CRC) has been selected by CBC Radio-Canada to ensure quality broadcast transmissions across the country.

The tool, called CRC-COVLAB, is a coverage prediction and analysis software used by radio and television network planners when determining transmission parameters. CBC Radio-Canada, a national voice for Francophone

broadcast news, has been using earlier versions of CRC coverage prediction software since 1997.

"CRC-COVLAB is now so powerful and complete that it has become our main broadcasting analysis tool – even experienced CBC engineers who were used to traditional broadcast tools have now migrated to this wonderful software," said Pascal Marcoux, an engineer who works in the strategy and planning division of CBC Radio-Canada. "Compared to other major broadcasting tools, we found the depth of study achievable with CRC-COVLAB is far superior, especially with regards to new technologies such as DAB, IBOC and DTV. The other major plus is the CRC team – their level of support is outstanding."

CBC Radio-Canada uses CRC-COVLAB for the planning of new stations, interference and coordination studies and analysis of new technologies. The software is useful for a wide range of applications, including FM radio, television, Digital Television (DTV), Digital Audio Broadcasting (DAB) and Satellite Digital Audio Radio Service (SDARS). In addition, the CRC software is utilized by CBC Radio-Canada for its Electronic News Gathering (ENG) and Studio-Transmitter Link (STL), which sends a radio or television station's audio and video from the broadcast studio to a transmitter in another location. The national news outlet even uses CRC-COVLAB to study microwave links and windmill farm interference.

First demonstrated in 1991, the strength and distinction of CRC-COVLAB from other simulation software is in its ability to simulate the behavior of a receiver. This leads to the capabilities of predicting the service coverage of a network of synchronized transmitters operating at a single frequency, in what is called a Single Frequency Network (SFN), while considering self-interference and interference from neighboring systems.

Within the past year, the CRC signed two major contracts for the use of CRC-COVLAB. LARCAN and Look Communications Inc., both broadcast solutions companies in Canada, have licensed CRC-COVLAB. In addition, the CRC recently donated a license of CRC-COVLITE, a simplified version of CRC-COVLAB, to the Southern Alberta Institute of Technology (SAIT) to be used as an educational tool for the Broadcast Technology program.

Since 1993, the CRC has sold approximately 60 licenses of CRC-COVLAB and related software in Canada, the United States, Mexico, Brazil, Australia, Switzerland, Taiwan and South Korea, generating over $733,000 in Canadian revenues.

Recently adopted by CBC Radio-Canada as a primary planning tool, CRC-COVLAB is a coverage prediction and analysis software.

*For more information about CRC-COVLAB, please visit: www.crc.ca/crc-covlab and www.crc.ca/crc-covlite.

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CRC Radio Project to Improve Military Communications

A research team at the Communications Research Centre Canada (CRC), in partnership with Defence Research and Development Canada (DRDC), is working to develop an improved tactical radio communications system to meet current and future military requirements. Known as the High Capacity Tactical Communications Network (HCTCN), this experimental system aims to provide several key improvements while optimizing the flow of data and voice information within bandwidth-constrained wireless networks.

"The Canadian military is always striving to exploit new technologies to meet the challenges of modern day operations," explained Joe Schlesak, the research manager leading the development of the HCTCN system. "The ability to effectively exchange information between the various mobile units is a critical issue for any tactical military operation. The increasing demand for data transmission to support situational awareness is rapidly exceeding the capabilities of the currently deployed low-bandwidth wireless networks, which use relatively low bit rate waveforms for transmission."

At the heart of CRC's experimental system is the development of a high data rate Very High Frequency (VHF) waveform, using advanced signal processing techniques. The higher data rates have allowed the introduction of network-centric capabilities, and the efficient integration of voice and data within bandwidth-constrained tactical communications systems.

By using a high data rate modem (64 kbps), the HCTCN demonstrator has introduced several new capabilities to the tactical network. In voice communication, in addition to the existing all-informed capability, the use of the Internet Protocol allowed for the possibility of selecting the called party(ies): point-to-point, point-to-multipoint, and conferencing capabilities were demonstrated. In addition, the new system allows for call pre-emption, where a higher ranking officer can interrupt an ongoing point-to-point call.

The HCTCN also aims to address the critical issue of reliability, for use in a military context. In consumer WiFi networks known as "hotspots," like those found in Internet cafés and airports, all nodes link into a base station. The reliability of such a system is inadequate

In a field demonstration to DND and Canadian Forces Land Staff, CRC showcased new tactical communications capabilities that would be possible through the use of wireless ad-hoc network architectures and high data-rate network-capable radios.

for military use, since if the base station stops functioning the entire network goes down.

The HCTCN provides greatly improved reliability through the use of a mobile ad-hoc networking (MANET) topology, where each radio becomes like a router, directing information packets to where they need to go. This means that it functions without being linked to a base station, thereby allowing for direct communication between two radios, and relaying. The latter capability is critical in the case where two radios are unable to communicate directly, due to distance, an obstacle between two nodes, and other factors. The ad-hoc nature of the network allows for survivability; if a commander radio becomes unusable, a second-in-command radio automatically takes over.

The HCTCN experimental system developed by CRC researchers has identified some practical challenges in the networking of low-bandwidth radio networks. These challenges have created opportunities for designing new, optimized network protocols for bandwidth-restricted, error-prone radio networks. Ongoing work is being conducted with international collaboration to address these challenges.

In addition to its tangible experimental system, CRC is also working to influence the development of a NATO standard for high-data-rate VHF radio communications. Through its partnerships, CRC plans to license and transfer the technology to Canadian industry.

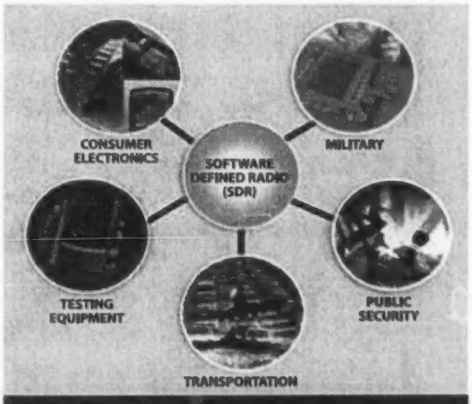
*For more information about CRC's military wireless R&D, please visit: http://crc.ca/en/html/crc/home/research/wireless/mil_wireless

A New Trend in Software Development: How it Affects You

Once upon a time, software was just a nerdy term for something related to a computer and used by scientists to resolve complex mathematical equations. Times have changed, and today software is anything but irrelevant. In fact, it has infiltrated nearly every industry and many aspects of our daily lives.

Simply defined as "a program that enables a computer to perform a specific task" (Wikipedia), software is now embedded in the computer systems of our programmable household electronics, car monitoring and safety equipment, medical equipment, radios and airplanes, to name but a few.

This ongoing proliferation of software is largely due to changes in the development process. Looking back to the early 80s, most electronic devices were developed using only hardware components. With the introduction of digital signal processors, however, we have slowly moved towards the use of software in our devices. By the 90s, software already had a major presence in "embedded systems" – those systems in which the computer is completely encapsulated by the device it controls. Embedded systems can range from portable devices such as MP3 players to large, stationary installations like traffic lights.



The development approach behind Software Defined Radio holds the potential to play a role in countless applications in our daily lives, from public security to consumer electronics.

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Today, an emerging trend in software development is "platform agnosticism," which means that the software is developed to operate on multiple platforms. This philosophy has been around for years in the personal computer industry, with software running on computers manufactured from different companies. For embedded systems, however, the platform is not as homogenous as a personal computer since it can be composed of a wide variety of processors (not just one Pentium processor), operating systems (such as Windows, Linux, VxWorks, Interity, QNX) and external peripherals (motors, sensors, displays, antennas).

At the Communications Research Centre Canada (CRC), researchers have created an environment that facilitates the development of platform agnostic software. Called the SCARI Suite, this environment provides a framework to isolate applications development from hardware development. In effect, the SCARI Suite enables a "component-based development" approach to software, in which an embedded system can be seen as an assembly of individual hardware and software components linked together. By using this approach, significant time and cost savings can be obtained in the development of embedded systems. Components from one project can be reused on other projects, and a modification to one component creates minimal impact on the overall system.

One applied area of technology where the component-based development approach is particularly useful is that of Software Defined Radio (SDR). Dubbed as the radio technology of the future, SDR can accommodate any communications protocol and frequency band simply by downloading the appropriate software on the selected radio hardware. While it was originally designed to solve military radio interoperability issues, SDR has many other real-life applications. For example, it enables emergency personnel (ambulance workers, police and firefighters) to quickly reconfigure their radios to a common communications protocol in order to connect during a crisis, such as a natural disaster like Hurricane Katrina.

In the near future, SDR and its approach to software development will not just be limited to configuring radios. While you may not see it, SDR-based technology will extend to many different domains, including space, avionics, automobile, public safety and commercial cellular industries. In the end, it means better products, developed faster and delivered to the store shelves – at a better price for you.

*For more information about CRC's work with Software Defined Radio (SDR) technology, please contact Claude Bélisle at claude.belisle@crc.ca or visit our Web site at www.crc.ca/sdr.

Broadband visual tools to connect 600 students across Canada

In partnership with five different technology and health organizations, the Communications Research Centre Canada (CRC) will participate in the largest VirtualClassroom group session to date, scheduled for April 19, 2007.

A record number of 600 students from across the country are expected to take part in the upcoming Youth Town Hall Session, to virtually discuss the topic of "Diet & Body Image." Six high schools in Edmonton, Toronto, Ottawa, St. John's and Fredericton will use CAnet 4 – Canada's very high-speed research and education network – to communicate by videoconference and through some newly-developed, research prototype visual communication tools.

"To our knowledge, this is the first time that a broadband cross-Canada youth town hall session has taken place," said CRC's John Spence, who co-manages the CRC/NRC VirtualClassroom with Dr. Martin Brooks at the National Research Council (NRC).

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"A variety of synchronous and asynchronous broadband visual tools and grouping strategies will be implemented to facilitate the sheer number of students," said Dr. Martin Brooks. "This will be a unique opportunity to leverage technology for citizen engagement and will allow students to gain experience in e-democracy."

While the CRC and the NRC will offer the network, technology tools and support to the equation, the heath and wellness aspect of the event will be rounded out with the support of the Centre for Global eHealth Innovation, the Global eHealth and Wellness Network Initiative (Department of Public Health Services, University of Toronto), the Canadian Paediatric Society and the Canadian Obesity Network. The partner health organizations will provide the latest scientific knowledge on diet and body image, and their members will participate as expert mentors during the session on April 19.

During the session, grade nine to 12 students will research the underlying factors that cause obesity and eating disorders. They will also discuss the physical, social and mental challenges they face in achieving a healthy lifestyle. Periodically, students at all locations will view pre-taped interviews offering various perspectives on topics related to diet and body image. For example, an NHL player with the Ottawa Senators will offer his views to students on the pressures of steroid use amongst young males.

In addition to the synchronous, real-time discussion during the videoconference, each school will have access to tools for user-generated online video as asynchronous visual communication. For example, in upcoming school sessions, each small group will generate a one-minute video using VCam, a visual communication answering machine. After VCam is used to describe the group's position on a health issue, it is mounted on the VCam server where it is immediately accessible to the other participating students. Subsequently, each group will be assigned to view and respond to several other groups' videos.

The VirtualClassroom program has been providing distance learning technologies to students within Canada and around the world for over 10 years. The program uses high-speed (10 MB to 1 GB) fibre optic and bidirectional satellite connections (500 kb to 1 MB) as well as broadband visual communication tools to create rich media-interactive learning environments.

Canadian students will meet in cyberspace to discuss body image issues.

CRC's mission is to be the federal government's centre of excellence for communications R&D, ensuring an independent source of advice for public policy purposes. CRC, an agency of Industry Canada, also aims to help identify and close the innovation gaps in Canada's communications sector by:

- *engaging in industry partnerships;*
- *building technical intelligence;*
- *supporting small and medium-sized high technology enterprises.*